

**\* NOTICES \***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**Bibliography**

- (19) [Publication country] Japan Patent Office (JP)  
(12) [Kind of official gazette] Open patent official report (A)  
(11) [Publication No.] JP,2000-191339,A (P2000-191339A)  
(43) [Date of Publication] July 11, Heisei 12 (2000. 7.11)  
(54) [Title of the Invention] Soluble glass, an antibacterial resin constituent, and antibacterial mold goods  
(51) [The 7th edition of International Patent Classification]

C03C 3/17  
A01N 25/10  
59/16

59/26  
C03C 3/19  
12/00  
14/00  
C08K 3/22  
3/40  
C08L101/16

**[FI]**

C03C 3/17  
A01N 25/10  
59/16 Z  
A  
59/26  
C03C 3/19  
12/00  
14/00  
C08K 3/22  
3/40  
C08L101/00

[Request for Examination] Un-asking.

[The number of claims] 9

[Mode of Application] OL

[Number of Pages] 11

(21) [Application number] Japanese Patent Application No. 10-372212

(22) [Filing date] December 28, Heisei 10 (1998. 12.28)

(71) [Applicant]

[Identification Number] 000162917

[Name] Koa Glass CO., LTD.

[Address] 1-25-27, Hirai, Edogawa-ku, Tokyo

(72) [Inventor(s)]

[Name] Ishii Masao

[Address] 1-25-27, Hirai, Edogawa-ku, Tokyo Inside of Koa Glass CO., LTD.

## (72) [Inventor(s)]

[Name] Tanaka Ken-ichi

[Address] 1-25-27, Hirai, Edogawa-ku, Tokyo Inside of Koa Glass CO., LTD.

## (74) [Attorney]

[Identification Number] 100086759

## [Patent Attorney]

[Name] Watanabe Kihei (besides one person)

[Theme code (reference)]

4G062

4H011

4J002

[F term (reference)]

4G062 AA10 AA15 BB09 DA01 DB03 DC01 DD05 DD06 DD07 DE03 DE04 DE05 DF01 EA01 EB02 EC01 ED01 ED02 ED03 EE03 E  
4H011 AA02 BB18 BC18 BC19 DA02 DC03 DC05 DH02  
4J002 AA011 AA021 BB031 BB121 BC031 BD031 BD101 BD121 BE021 BF021 BG051 CB001 CC041 CC181 CD001 CF061 CF071

---

[Translation done.]

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

Epitome

## (57) [Abstract]

[Technical problem] While there is allochroic [ little ] (yellow), soluble glass excellent in transparency, an antibacterial resin constituent, and antibacterial mold goods are offered.

[Means for Solution] Ag ion is set on the soluble glass which may be eluted, and it is Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub> as a constituent. When it contains and the amount of the soluble whole glass concerned is made into 100 % of the weight, They are the value of 0.2 – 5% of the weight of within the limits, and the content of ZnO about the content of Ag<sub>2</sub>O The value of 1 – 50% of the weight of within the limits, and P<sub>2</sub>O<sub>5</sub> The soluble glass characterized by making a content into the value of 30 – 80% of the weight of within the limits, the antibacterial resin constituent using it, and antibacterial mold goods.

---

[Translation done.]

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

## CLAIMS

---

### [Claim(s)]

[Claim 1] Ag ion is set on the soluble glass which may be eluted, and it is Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub> as a constituent. When it contains and the amount of the soluble whole glass concerned is made into 100 % of the weight They are the value of 0.2 – 5% of the weight of within the limits, and the content of ZnO about the content of Ag<sub>2</sub>O The value of 1 – 50% of the weight of within the limits, and P<sub>2</sub>O<sub>5</sub> Soluble glass characterized by making a content into the value of 30 – 80% of the weight of within the limits.

[Claim 2] Soluble glass characterized by making into the value of 1–50 within the limits the weight ratio expressed with the content of the content / Ag<sub>2</sub>O of ZnO in soluble glass according to claim 1.

[Claim 3] Soluble glass characterized by making the content concerned of CaO into the value of 1 – 20% of the weight of within the limits as a constituent, including CaO in soluble glass according to claim 1 or 2.

[Claim 4] It sets on soluble glass given in any 1 term of claims 1–3, and is CeO<sub>2</sub> as a constituent. It contains and is CeO<sub>2</sub> concerned. Soluble glass characterized by making a content into the value of 0.1 – 5% of the weight of within the limits.

[Claim 5] Soluble glass characterized by making light transmittance of the soluble glass concerned into the value of 50 – 100% of within the limits in soluble glass given in any 1 term of claims 1–4.

[Claim 6] Soluble glass characterized by the soluble glass concerned being powdered and making mean particle diameter of the soluble glass concerned the value within the limits of 0.1–1000 micrometers in soluble glass given in any 1 term of claims 1–5.

[Claim 7] Soluble glass characterized by the soluble glass concerned being powdered and covering an inorganic substance and the organic substance, or either around the soluble glass concerned in soluble glass given in any 1 term of claims 1–6.

[Claim 8] The antibacterial resin constituent which comes to mix soluble glass given in any 1 term of claims 1–7 into resin.

[Claim 9] Antibacterial mold goods which come to carry out the laminating of the soluble glass of a publication to any 1 term of claims 1–7 on a front face.

---

[Translation done.]

### \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] About the soluble glass which may be eluted in Ag ion, an antibacterial resin constituent, and antibacterial mold goods, in more detail, this invention relates to soluble glass excellent in transparency, an antibacterial resin constituent, and antibacterial mold goods while having allochroic [ little ] (yellow).

#### [0002]

[Description of the Prior Art] In order to give antibacterial effectiveness in recent years to building

materials, home electronics (TV, a personal computer, a cellular phone, a video camera, etc. are included), miscellaneous goods, the materials for a package, etc., the antibacterial resin constituent which made soluble glass mix into specified quantity resin is used.

[0003] As such soluble glass, the glass chemical for water treatment which may be eluted in Ag ion is indicated by JP,62-210098,A. this glass chemical for water treatment — the inside of a constituent — Ag ion of monovalence — per glass 100 weight section — silver-oxide conversion — 0.2 – 1.5 weight section content — carrying out — as a glass component — B-2 O<sub>3</sub> 20–70-mol % — it consists of soluble glass of the borosilicate system to contain. And more specifically in the examples 2 and 3 of the patent official report concerned, it is B-2 O<sub>3</sub>, respectively. It is 20–30-mol % and ZnO 40-mol % and P<sub>2</sub>O<sub>5</sub> The soluble glass of the presentation which consists 30–40-mol % and Ag<sub>2</sub>O of 1 % of the weight is indicated.

[0004] Moreover, the \*\*\*\*\* film is indicated by JP,1-303150,A as an antibacterial resin constituent using the soluble glass which may be eluted in Ag ion. It is a \*\*\*\*\* film containing a copper ion and/or Ag ion, it sets in the example 2, and this \*\*\*\*\* film is B-2 O<sub>3</sub>. : 29 % of the weight, SiO<sub>2</sub> : 51 % of the weight, Na<sub>2</sub>O:10 % of the weight, ZnO:4 % of the weight, aluminum 2O<sub>3</sub> : The soluble glass which consists of 1 % of the weight and Ag<sub>2</sub>O:5 % of the weight is indicated.

[0005] Furthermore, the synthetic-resin molding object which contains soluble glass in resin is indicated by JP,1-313531,A as an antibacterial resin constituent. The synthetic-resin molding object concerned is SiO<sub>2</sub>, B-2 O<sub>3</sub>, and P<sub>2</sub>O<sub>5</sub> concretely. One sort or two sorts or more of mesh formation oxides, In the glass solid 100 weight section which consists of one sort or two sorts or more of mesh modifier oxides, Na<sub>2</sub>O, K<sub>2</sub>O, and CaO and ZnO, as Ag of monovalence Have considered as the configuration which contained in resin the soluble glass which carried out 0.1–20 weight section content of the Ag<sub>2</sub>O, and it sets in the example. SiO<sub>2</sub> : 40-mol %, B-2 O<sub>3</sub> : The soluble glass which carried out 2 weight sections addition of the Ag<sub>2</sub>O is indicated to the mixture 100 weight section which consists of 50-mol % and Na<sub>2</sub>O:10-mol %.

#### [0006]

[Problem(s) to be Solved by the Invention] however, the soluble glass indicated by JP,62-210098,A -- B-2 O<sub>3</sub> 20–70-mol % — although considered because it contains, soluble glass became cloudy and the problem of being lacking in transparency was seen. Therefore, when it mixed in resin or the laminating of the scarce soluble glass was carried out to this transparency on the front face of resin mold goods, the problem of spoiling the color and transparency which resin itself has was seen.

[0007] Moreover, the soluble glass currently indicated by JP,1-303150,A is B-2 O<sub>3</sub> like the soluble glass indicated by JP,62-210098,A. Although considered because it contains so much, soluble glass was cloudy (lacking in transparency), and the problem that a mechanical strength was also low was seen. And although the soluble glass currently indicated by the official report concerned was considered because there is little amount of ZnO used, the problem of being easy to yellow by aging easily was seen.

[0008] Furthermore, the soluble glass currently indicated by JP,1-313531,A is B-2 O<sub>3</sub>. It uses as a principal component and the loadings of a mesh formation oxide and a mesh modifier oxide were not optimized, but the transparency of soluble glass fell, the configuration of a constituent became complicated, or problems, like production time becomes long were seen.

[0009] Then, this invention person is B-2 O<sub>3</sub> used as one of the causes of yellowing, as a result of inquiring wholeheartedly. It used to find out that yellowing of soluble glass etc. can be prevented, without using it. That is, Ag<sub>2</sub>O is Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub>, although soluble glass may yellow as a cause of main. It influences each other mutually and is ZnO and P<sub>2</sub>O<sub>5</sub>. By adding by predetermined within the limits, the yellowing concerned can be prevented efficiently and, moreover, a header and this invention are completed for the transparency and the mechanical strength of soluble glass being improvable.

#### [0010]

[Means for Solving the Problem] This invention is soluble glass which may be eluted in Ag ion, and is Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub> as a constituent. When it contains and the amount of the soluble whole glass concerned is made into 100 % of the weight They are the value of 0.2 – 5% of the weight of within the limits, and the content of ZnO about the content of Ag<sub>2</sub>O The value of 1 – 50% of the weight of within the limits, and P<sub>2</sub>O<sub>5</sub> It is characterized by making a content into the value of 30 – 80% of the weight of within the limits. However, Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub> When not filling the total quantity to 100% of the weight, they are components other than these, for example, CaO and aluminum 2O<sub>3</sub>. It will be sufficient by MgO etc. Thus, by constituting soluble glass, it is B-2 O<sub>3</sub>. Without using it, the transparency and the mechanical strength of soluble glass can be improved and, moreover, yellowing of soluble glass can be prevented effectively. Moreover, P<sub>2</sub>O<sub>5</sub> Since a content is also suitable, it can dissolve easily with surrounding

moisture, elution of the Ag ion can be carried out to homogeneity, and, moreover, the transparency and the mechanical strength of the soluble glass concerned can be improved.

[0011] Moreover, in constituting the soluble glass of this invention, it is desirable to make into the value of 1–50 within the limits the weight ratio expressed with the content of the content / Ag<sub>2</sub>O of ZnO. Since Ag<sub>2</sub>O is mainly involving, yellowing of soluble glass can prevent yellowing of soluble glass more efficiently by defining the content of ZnO on the basis of the content of Ag<sub>2</sub>O in this way.

[0012] Moreover, in constituting the soluble glass of this invention, it is desirable to make the content concerned of CaO into the value of 1 – 20% of the weight of within the limits as a constituent, including CaO. Thus, by constituting soluble glass including CaO, an interaction with ZnO can be demonstrated and yellowing of soluble glass can be prevented more efficiently.

[0013] Moreover, it is in charge of constituting the soluble glass of this invention, and is CeO<sub>2</sub> as a constituent. It contains and is CeO<sub>2</sub> concerned. It is desirable to make a content into the value of 0.1 – 5% of the weight of within the limits. Thus, when the transparency and the mechanical strength of soluble glass can be improved and an electron ray is further irradiated by constituting soluble glass, it can prevent effectively that the soluble glass concerned discolors (a black system, tea system).

[0014] Moreover, in constituting the soluble glass of this invention, it is desirable to make light transmittance of the soluble glass concerned into the value of 50 – 100% of within the limits. Thus, a possibility of spoiling the color and transparency which resin itself has by constituting soluble glass decreases more, further; since soluble glass can be added comparatively so much, it can continue more at a long period of time, and antibacterial control can be carried out easily. Therefore, it is that it is more desirable to make light transmittance of the soluble glass concerned into the value of 70 – 100% of within the limits, and it considers as the value of 80 – 100% of within the limits the optimal from a viewpoint which the transparency at the time of making soluble glass mix in resin etc. can be raised more, and can make [ many ] an addition (the amount used). In addition, the light transmittance of soluble glass can process tabular [ with a thickness of 3mm ] by the ability making the soluble glass concerned into an example, and can be computed by measuring the amount of light transmission at the time of making this tabular glass penetrate the light with a wavelength of 400nm – 700nm using an absorptiometer.

[0015] Moreover, in constituting the soluble glass of this invention, the soluble glass concerned is powdered and it is desirable to make mean particle diameter of the soluble glass concerned into the value within the limits of 0.1–1000 micrometers. Also when the soluble glass which has such mean particle diameter was used, and mixing into resin becomes easy, and an antibacterial resin constituent is cast and it considers as a cast, the outstanding surface smooth nature is obtained. In addition, the mean particle diameter of soluble glass is easily controllable by combining the grinding method and the classifying method.

[0016] Moreover, in constituting the soluble glass of this invention, the soluble glass concerned is powdered and it is desirable to cover an inorganic substance and the organic substance, or either around the soluble glass concerned. Thus, by constituting soluble glass, the rate of dissolution of Ag ion can be controlled easily, and it can continue at a long period of time, and can maintain antibacterial. Moreover, the dispersibility of soluble glass can be improved and mixing into resin can be made easier.

[0017] Moreover, another mode of this invention is an antibacterial resin constituent, and is characterized by making it come into resin to mix the above-mentioned soluble glass. Thus, using surrounding moisture, the constituted antibacterial resin constituent can be eluted in Ag ion of optimum dose, and can demonstrate the antibacterial effectiveness which was excellent over the long period of time. Moreover, it also has the description that this antibacterial resin constituent has high transparency.

[0018] Moreover, another modes of this invention are antibacterial mold goods, and are characterized by coming to carry out the laminating of the above-mentioned soluble glass on the surface of a cast. In addition, although a cast is not especially restricted if a fixed configuration can be held, it may be a cast which consists of resin, for example, or may be a cast which consists of a metal, a ceramic, glass, a tree, paper, cloth, etc.

[0019]

[Embodiment of the Invention] Hereafter, the gestalt of the operation in the soluble glass of this invention and the antibacterial resin constituent using it is explained concretely.

[0020] The 1st operation gestalt of [operation gestalt of \*\* 1st] this invention is soluble glass, and is Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub>. It considers as a constituent and is a specified quantity \*\*\*\* thing. Hereafter, the component for constituting the soluble glass of this invention etc. is explained concretely.

[0021] 1. Ag<sub>2</sub>O<sub>2</sub>Ag<sub>2</sub>O is an indispensable constituent in the soluble glass of this invention, and can use the soluble glass concerned as antibacterial glass by carrying out elution of the Ag ion. Here, the content of Ag<sub>2</sub>O is made into the value of 0.2 – 5% of the weight of within the limits because antibacterial [ of soluble glass ] becomes inadequate, and when the content of Ag<sub>2</sub>O becomes less than 0.2 % of the weight, in order to acquire antibacterial predetermined effectiveness, it is because a lot of soluble glass is needed. It is because it will become easier to discolor soluble glass, and cost will become high and it will become disadvantageous economically on the other hand, if the content of Ag<sub>2</sub>O exceeds 5 % of the weight.

Therefore, the balance of antibacterial [ of soluble glass ], discoloration tightness, etc. is that making the content of Ag<sub>2</sub>O into the value of 1 – 4% of the weight of within the limits considers as the value of 1.5 – 3% of the weight of within the limits more desirable still more preferably from a better viewpoint.

[0022] 2. ZnO<sub>2</sub>ZnO is an indispensable constituent in the soluble glass of this invention, and has achieved the function as a mesh modifier oxide fundamentally. However, in addition to this, ZnO also has the function for preventing yellowing of soluble glass in this invention. If, as for making the content of ZnO into the value of 1 – 50% of the weight of within the limits, the content of ZnO becomes less than 1 % of the weight here — yellowing — it is because the prevention effectiveness becomes inadequate, and on the other hand, when the content of ZnO exceeds 50 % of the weight, it is because the transparency of soluble glass falls or a mechanical strength becomes scarce. Therefore, it is considering as the value of 3 – 20% of the weight of within the limits more preferably [ making the content of ZnO into the value of 2 – 30% of the weight of within the limits ], and the optimal from a viewpoint with the better balance of the discoloration tightness of soluble glass, transparency, etc.

[0023] Moreover, it is desirable to define the content of ZnO in consideration of the content of Ag<sub>2</sub>O. It is desirable to specifically make into the value of 1–50 within the limits the weight ratio expressed with the content of the content / Ag<sub>2</sub>O of ZnO. This reason may be unable to prevent yellowing of soluble glass efficiently, if this weight ratio becomes less than 1.0, and on the other hand, when this weight ratio exceeds 50, it is because soluble glass may become cloudy or it may yellow conversely. Therefore, it is more desirable to make this weight ratio into the value of 1.5–30 within the limits, and it is still more desirable to consider as the value of 2–10 within the limits.

[0024] 3. P<sub>2</sub>O<sub>5</sub>P<sub>2</sub>O<sub>5</sub> Although it is an indispensable constituent in the soluble glass of this invention and the function as a mesh formation oxide is achieved fundamentally, in this invention, it participates also in the uniform emission nature of the transparency improvement function of soluble glass, or Ag ion. Here, it is P<sub>2</sub>O<sub>5</sub>. The reason for making a content desirable [ the value of 30 – 80% of the weight of within the limits ] The P<sub>2</sub>O<sub>5</sub> concerned When a content becomes less than 30 % of the weight, the transparency of soluble glass falls or Or it is because there is a possibility that the uniform emission nature and the uniform mechanical strength of Ag ion may become scarce, and, on the other hand, is P<sub>2</sub>O<sub>5</sub>. When a content exceeds 80 % of the weight, it becomes and there is a possibility that soluble glass may become being easy to yellow deficiently in hardenability, and a mechanical strength may fall. Therefore, a viewpoint with the better balance of the transparency of soluble glass, discoloration tightness, etc. to P<sub>2</sub>O<sub>5</sub> It is considering as the value of 30 – 70% of the weight of within the limits more preferably [ making a content into the value of 30 – 75% of the weight of within the limits ], and the optimal.

[0025] 4. The constituent (1) CaO<sub>2</sub>CaO in other soluble glass is an arbitration constituent in the soluble glass of this invention, and when it uses for this invention, it achieves the function as a mesh modifier oxide fundamentally. However, CaO can demonstrate the function of, reducing the heating temperature at the time of creating soluble glass in this invention in addition to this. Here, it is desirable to make the content of CaO into the value of 1 – 20% of the weight of within the limits. The reason is because there is a possibility that the addition effectiveness (the melting temperature fall effectiveness) may not be demonstrated, when the content concerned of CaO becomes less than 1 % of the weight, and it is because there is a possibility that the transparency of soluble glass may fall, on the other hand when the content of CaO exceeds 20 % of the weight. Therefore, it is considering as the value of three to 12 weight within the limits more preferably [ making the content of CaO into the value of 2 – 15% of the weight of within the limits ], and the optimal from a viewpoint with the better balance of the melting temperature fall effectiveness of soluble glass, transparency, etc.

[0026] (2) CeO<sub>2</sub>CeO<sub>2</sub> It is an arbitration constituent in the soluble glass of this invention, and the function as a mesh modifier oxide is achieved fundamentally. However, CeO<sub>2</sub> In addition to this, when it uses in this invention, the transparency improvement function of soluble glass is also demonstrated. Moreover, CeO<sub>2</sub> By adding, it can also raise allochroic [ over an electron ray ]. Here, it is CeO<sub>2</sub>. It is desirable to make a

content into the value of 0.1 – 5% of the weight of within the limits. The reason is CeO<sub>2</sub> concerned. It is because the addition effectiveness (transparency improvement function) may not be demonstrated if a content will be less than 0.1 % of the weight, and, on the other hand, is CeO<sub>2</sub>. When a content exceeds 5 % of the weight, it is because cost may become high and may become disadvantageous economically. Therefore, a viewpoint with the better balance of the economical efficiency of soluble glass, discoloration tightness, etc. to CeO<sub>2</sub> It is considering as the value of 0.3 – 2% of the weight of within the limits more preferably [ making a content into the value of 0.2 – 3% of the weight of within the limits ], and the optimal.

[0027] (3) MgOMgO is an arbitration constituent in the soluble glass of this invention, and achieves the function as a mesh modifier oxide fundamentally. However, in addition to this, MgO also demonstrates the transparency improvement function of soluble glass, when it uses in this invention. Here, it is desirable to make the content of MgO into the value of 0.1 – 15% of the weight of within the limits. The reason is because there is a possibility that the addition effectiveness (transparency improvement function) may not be demonstrated, when the content concerned of MgO becomes less than 0.1 % of the weight, and it is because there is a possibility that cost may become high and may become disadvantageous economically if the content of MgO exceeds 15 % of the weight, on the other hand. Therefore, it is considering as the value of 1 – 10% of the weight of within the limits more preferably [ making the content of MgO into the value of 0.5 – 12% of the weight of within the limits ], and the optimal from a viewpoint with the better balance of the economical efficiency of soluble glass, discoloration tightness, etc.

[0028] (4) Na<sub>2</sub>O is an arbitration constituent in the soluble glass of this invention, and when it uses for this invention, it achieves the function as a mesh modifier oxide fundamentally. However, in addition to this, Na<sub>2</sub>O demonstrates the transparency improvement function of soluble glass etc. in this invention. Here, it is desirable to make the content of Na<sub>2</sub>O into the value of 0.1 – 10% of the weight of within the limits. The reason is because there is a possibility that the addition effectiveness (transparency improvement function) may not be demonstrated, when the content of the Na<sub>2</sub>O concerned becomes less than 0.1 % of the weight, and it is because there is a possibility that the transparency of soluble glass may fall, on the other hand when the content of Na<sub>2</sub>O exceeds 10 % of the weight. Therefore, it is considering as the value of 0.5 to 3 weight within the limits more preferably [ making the content of Na<sub>2</sub>O into the value of 0.2 – 5% of the weight of within the limits ], and the optimal from a viewpoint with the better balance of the transparency of soluble glass, discoloration tightness, etc.

[0029] (5) aluminum<sub>2</sub>O<sub>3</sub>aluminum 2O<sub>3</sub> It is an arbitration constituent in the soluble glass of this invention, and when it uses for this invention, the function as a mesh formation oxide is achieved fundamentally. However, in addition to this, it is aluminum 2O<sub>3</sub>. In this invention, the improvement function of the mechanical strength of soluble glass or transparency can also be demonstrated. Here, it is aluminum 2O<sub>3</sub>. It is desirable to make a content into the value of 0.1 – 20% of the weight of within the limits. The reason is the aluminum 2O<sub>3</sub> concerned. It is because there is a possibility that the addition effectiveness (transparency improvement function) may not be demonstrated if a content becomes less than 0.1 % of the weight, and, on the other hand, is aluminum 2O<sub>3</sub>. When a content exceeds 20 % of the weight, it is because there is a possibility that the transparency of soluble glass may fall. Therefore, a viewpoint with good mechanical strength of soluble glass and balance of transparency to aluminum 2O<sub>3</sub> It is considering as the value of 2 – 10% of the weight of within the limits preferably [ making a content into the value of 1 – 15% of the weight of within the limits ], and more preferably.

[0030] (6) It is also possible to carry out specified quantity addition of K<sub>2</sub>O, SiO<sub>2</sub>, the BaO, etc. within the limits of the purpose of this invention as other constituent network modifiers.

[0031] 5. Especially about the gestalt of the gestalt solubility glass of soluble glass, it is not restricted and can consider as gestalten, such as the shape of the shape of the shape of a particle, powder, mass, and a rectangle, cylindrical, and a polygon, and flat. Moreover, it is desirable to make mean particle diameter of soluble glass into the value within the limits of 0.1–1000 micrometers about the gestalt of soluble glass. If the soluble glass which has such mean particle diameter is used, mixing into resin will become easy and handling will become easy. Moreover, also when it considers as an antibacterial resin constituent or antibacterial mold goods, the outstanding surface smooth nature can be obtained. In addition, the mean particle diameter of soluble glass is easily controllable by combining the grinding method and the classifying method.

[0032] Moreover, as the part was mentioned above about the gestalt of soluble glass, soluble glass is powdered and considering as the gestalt which covered an inorganic substance and the organic substance, or either around the soluble glass concerned also has it. [desirable] Thus, by constituting soluble glass,

control of the rate of dissolution of Ag ion can be made easy, and the dispersibility of soluble glass can be improved. In addition, as an inorganic substance which covers soluble glass, titanium oxide, a ceramic particle, etc. are desirable and an acrylic particle etc. is desirable as the organic substance similarly.

[0033] 6. Although especially the manufacture approach of the soluble glass in the operation gestalt of the manufacture approach 1st of soluble glass is not restricted, it can be concretely manufactured according to the process shown below.

[0034] (1) glass raw-material mixing process Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub> etc. -- after carrying out weighing capacity of the glass raw material correctly, it is the process mixed to homogeneity. It is desirable to face to mix and to use mixed machines (mixer), such as an alumina-ceramics \*\*\*\*\* machine, a ball mill, and a propeller mixer.

[0035] (2) It is the process which is made to carry out melting of the glass raw material mixed to glass raw-material melting process homogeneity using a glass melting furnace etc., and creates melting glass. In addition, as melting temperature, it is desirable as 600–1500-degree C conditions and melting time amount to adopt the conditions of 0.1 – 24 hours from a viewpoint which can lessen xanthochroism of the soluble glass at the time of manufacture as much as possible from a viewpoint which raises productive efficiency.

[0036] (3) It is the process which grinds the melting glass with which soluble glass \*\*\*\*\* was obtained, and makes it a particle, i.e., the soluble glass of this invention. Specifically, it is desirable to perform coarse grinding (for water grinding to be included.) and pulverizing at the point that the glass particle which has uniform particle diameter is obtained efficiently. However, it is also desirable after this process to carry out a classification process depending on an application. On the other hand, this process can also be skipped depending on another application. In that case, the soluble glass obtained after process termination of (2) can be used as it is as antibacterial glass.

[0037] [the 2nd operation gestalt] -- Ag<sub>2</sub>O and ZnO whose antibacterial resin constituent which is the 2nd operation gestalt is the 1st operation gestalt, and P<sub>2</sub>O<sub>5</sub> Specified quantity mixing is carried out into the resin (transparence or opaque resin) which shows below the soluble glass included as a constituent.

[0038] 1. In creating the antibacterial resin constituent of transparence resin this invention, it is possible to make it mix into the transparence resin which shows soluble glass below. As desirable transparence resin, one sort, such as polyethylene resin (PE), polypropylene resin (PP), polyethylene terephthalate resin (PET), polybutyrene terephthalate resin (PBT), polycarbonate resin (PC), styrene resin (PS), vinylidene chloride resin, vinyl acetate system resin, polyvinyl alcohol resin, fluorine system resin, poly arylene resin, acrylic resin, epoxy system resin, transparence vinylchloride resin, ionomer resin, polyamide system resin, and polyacetal system resin, or two sorts or more can be mentioned. In addition, when using the transparence resin of such a class, it is using what has the light transmittance of 80 – 100% of within the limits preferably [ using what has the light transmittance concretely defined by the following type of 50 – 100% of within the limits ], and more preferably. Moreover, the amount of transmitted lights and the amount of incident light can be measured using an absorptiometer or an actinometer (power meter). What was made tabular [ with a thickness of 1mm ] can be used for transparence resin in the case of the measurement. The amount of light transmittance (%).= transmitted lights / amount xof incident light 100

[0039] 2. In creating opaque resin and the antibacterial resin constituent of this invention, it is possible to also make soluble glass mix into opaque resin. The following can be mentioned as desirable opaque resin. For example, polyethylene resin (PE), polypropylene resin (PP), Polyethylene terephthalate resin (PET), polybutyrene terephthalate resin (PBT), Polycarbonate resin (PC), styrene resin (PS), vinylidene chloride resin, Vinyl acetate system resin, polyvinyl alcohol resin, fluorine system resin, poly arylene resin, As opposed to transparence resin, such as acrylic resin, epoxy system resin, transparence vinylchloride resin, ionomer resin, polyamide system resin, and polyacetal system resin One sort, such as resin which carried out specified quantity addition of a pigment, a coating, the color, etc., and was made opaque, and phenol resin opaque at itself, melamine resin, or two sorts or more can be mentioned. In addition, when using the opaque resin of such a class, it is concretely desirable more preferably to use what has the light transmittance defined by the above-mentioned formula of 0 – 30% of within the limits 0 – 50% of within the limits.

#### [0040] 3. Amount of Mixing of Soluble Glass (Addition)

In creating the antibacterial resin constituent of this invention, it is desirable to make the amount of mixing of per resin 100 weight section and soluble glass into the value of 0.01 – 10 weight section within the limits. This reason is for antibacterial to fall, if the amount of mixing of soluble glass becomes under the 0.01 weight section, and for the case where, and mixing becomes difficult or the transparency of an

antibacterial resin constituent falls to arise on the other hand, if the amount of mixing of soluble glass exceeds 10 weight sections. [ that the mechanical strength of an antibacterial resin constituent falls ] Therefore, it is making the amount of mixing of per resin 100 weight section and soluble glass into the value of 0.3 – 3 weight section within the limits more preferably [ considering as the value of 0.1 – 5 weight section within the limits ], and the optimal from a viewpoint the balance of an antibacterial, a mechanical strength, etc. in this antibacterial resin constituent being more desirable.

[0041] 4. Although especially the manufacture approach of the antibacterial resin constituent in the operation gestalt of the manufacture approach 2nd of an antibacterial resin constituent is not restricted, it can be concretely manufactured according to the process shown below.

[0042] (1) In the operation gestalt of the manufacture 1st of soluble glass, soluble glass can be manufactured according to a glass raw-material mixing process, a glass raw-material melting process, and a soluble glass grinding process as already explained.

[0043] (2) After carrying out weighing capacity of the manufacture solubility glass of an antibacterial resin constituent correctly, it is the process mixed to homogeneity to resin. Specifically, it is desirable to be able to scour, to be able to take the crowded method, the applying method, a diffusion method, etc., for example, to carry out churning mixing at a room temperature (25 degrees C) for 10 minute – 24 hours, when it is churning alligation, churning alligation and. Moreover, it is desirable to use mixed machines (mixer), such as an alumina-ceramics \*\*\*\*\* machine, a ball mill, a propeller mixer, 3 rolls, and V blender, although it mixes, to add an organic solvent and lubricant to it further, and to carry out viscosity preparation of resin to it.

[0044] [the 3rd operation gestalt] — the antibacterial mold goods which are the 3rd operation gestalt can carry out the laminating of the soluble glass which is the 1st operation gestalt on the surface of a cast, and can constitute it.

[0045] 1. Especially the gestalt of antibacterial mold-goods antibacterial mold goods is not restricted, carries out the laminating of the antibacterial resin constituent on the surface of a cast, and should just become. Moreover, the antibacterial resin constituent itself can be processed into a predetermined configuration, and it can also consider as the antibacterial cast which carried out the laminating of the antibacterial resin constituent on the surface of the cast. In addition, the gestalt of antibacterial mold goods is employable suitably according to an application, for example, carries out the laminating of the antibacterial resin constituent to the front face of mold goods, such as a bag, shoes, a toy, clothes, underwear, socks, and a bath bucket, and should just become it. Moreover, when the antibacterial resin constituent itself is processed and it considers as an antibacterial cast, it is desirable to consider as the shape of the shape of the shape of tabular and a film and a method object of merit and a square object, a globular shape, a cylinder, or a variant object.

[0046] 2. Although especially the manufacture approach of the antibacterial mold goods in the operation gestalt of the manufacture approach 3rd of antibacterial mold goods is not restricted, it can be concretely manufactured according to the process shown below.

[0047] (1) In the operation gestalt of the manufacture 1st of soluble glass, soluble glass can be manufactured according to a glass raw-material mixing process, a glass raw-material melting process, and a soluble glass grinding process as already explained.

[0048] (2) In the operation gestalt of the manufacture 2nd of an antibacterial resin constituent, after carrying out weighing capacity of the soluble glass correctly as already explained, an antibacterial resin constituent can be manufactured by carrying out churning mixing to homogeneity to resin.

[0049] (3) What is necessary is to carry out the laminating of the antibacterial resin constituent to the front face of the manufacture mold goods of antibacterial mold goods, and just to become it. Although especially the approach of this laminating is not restricted, it can take the bar coat method, a spray coating method, the knife coat method, the gravure coat method, dip coating, etc. It is desirable in that case to carry out the laminating of the antibacterial resin constituent to the thickness of 1–1000 micrometers on the surface of mold goods. This reason is because it may become difficult to carry out a laminating to homogeneity or it may be desorbed from the front face of mold goods, when the adhesion force over the front face of mold goods may decline if the thickness of an antibacterial resin constituent is set to less than 1 micrometer, and thickness exceeds 1000 micrometers on the other hand. Therefore, it is more desirable to make thickness of an antibacterial resin constituent into the value within the limits of 3–500 micrometers, and it is still more desirable to consider as the value within the limits which are 5–100 micrometers.

[0050] Moreover, when processing the antibacterial resin constituent itself into a predetermined configuration, an antibacterial resin constituent can be easily processed with injection molding which used metal mold. In that case, although it is desirable to perform injection molding below with the decomposition temperature of resin, the soluble glass of this invention can obtain the antibacterial mold goods which do not discolor and have high transparency as a result in decomposition temperature extent of resin.

[0051]

[Example] Hereafter, an example explains this invention to a detail further. However, the following explanation does not show this invention in instantiation, and this invention is not restricted to these publications.

[0052] [Example 1]

(Creation of soluble glass) When the amount of the soluble whole glass is made into 100 % of the weight P2O5 The presentation ratio of CaO 68% of the weight 10 % of the weight, [ a presentation ratio ] For the presentation ratio of MgO, the presentation ratio of 8 % of the weight and ZnO is 5 % of the weight and aluminum 2O3. For the presentation ratio of 5 % of the weight and Ag2 O, the presentation ratio of 3 % of the weight and Na2 O is [ a presentation ratio ] 0.5 % of the weight and CeO2. So that a presentation ratio may become 0.5 % of the weight Each raw materials for glass were mixed to homogeneity within the crucible using the alumina-ceramics \*\*\*\*\* machine. Subsequently, using the glass melting furnace, raw materials for glass were heated on 1100 degrees C and the conditions of 1 hour, and melting glass was created. Then, it water-granulated roughly by slushing underwater the melting glass taken out from the glass melting furnace. And after carrying out coarse grinding (mean particle diameter of about 100 micrometers) using a mortar further, it pulverized using the vibration ball mill, checking under a microscope (mean particle diameter of about 5 micrometers), and considered as the soluble glass (particle) of this invention.

[0053] (Evaluation of soluble glass)

(1) Evaluation 1 (transparency evaluation 1)

The microscope was used and the transparency of the obtained soluble glass was judged on the following criteria. A result is shown in Table 1.

O : it is transparent and colorless.

O: a part -- be an opaque feeling.

\*\*: There is a feeling of white in part.

x: It is completely white.

[0054] (2) Evaluation 2 (transparency evaluation 2)

The soluble glass obtained on this plate was laid in homogeneity, using a red polypropylene plate (2mm in thickness) as a substrate. And it judged on the following criteria whether a microscope would be used and the color of the polypropylene plate concerned could recognize through soluble glass. A result is shown in Table 1.

O : the color of a substrate can recognize completely.

O: there is admiration with which the color of a substrate fades slightly.

\*\*: There is admiration with which a part of color of a substrate fades.

x: The color of a substrate cannot recognize completely.

[0055] (3) Evaluation 3 (xanthochroism evaluation 1)

To the obtained soluble glass, ultraviolet rays (black panel temperature : setting [ 63 degrees C, an illuminance : ] in light with a wavelength of 300–700nm 255 W/m<sup>2</sup>) were continuously irradiated using the black light (sunshine weatherometer), and the xanthochroism of soluble glass was judged on the following criteria. In addition, the xanthochroism of soluble glass was measured using the microscope. A result is shown in Table 1.

O It is transparent and colorless after :100-hour progress.

O It is transparent and colorless after :50-hour progress.

\*\*: It is transparent and colorless after 10-hour progress.

x: It has yellowed after 10-hour progress.

[0056] (4) Evaluation 4 (xanthochroism evaluation 2)

The obtained soluble glass was immersed into tap water (20 degrees C), and the xanthochroism of soluble glass was judged on the following criteria. In addition, the xanthochroism of soluble glass was measured using the microscope. A result is shown in Table 1.

O It is transparent and colorless after :1000-hour progress.

O It is transparent and colorless after :500-hour progress.

\*\*: It is transparent and colorless after 100-hour progress.

x: It has yellowed after 100-hour progress.

[0057] (5) Evaluations 5–8 (antibacterial evaluation)

The obtained soluble glass was made to mix into polypropylene resin, respectively so that it may become 0.2 % of the weight and 0.3 % of the weight, and a total of six kinds of resin containing soluble glass was created. On the other hand — a trial bacillus — Trypticase Soy in the agar plate agar of Agar (BBL), it cultivates for 24 hours and 35 degrees C of growth clusters are suspended in the nutrient broth culture medium (EIKEN CHEMICAL CO., LTD. make) of 1/500 concentration — making — about — it prepared so that it might be set to 1x10<sup>6</sup> CFU/ml. Subsequently, the resin containing soluble glass concerned was cast, respectively to 2mm in thickness, 5cm long, and a 5cm wide test piece. And 0.5ml of suspension of *Staphylococcus aureus* (*Staphylococcus aureus* IFO#12732) and 0.5ml of suspension of *Escherichia coli* (*Escherichia coli* ATCC#8739) were contacted to homogeneity, respectively, the film made from polyethylene (sterilization) was further put on six kinds of obtained test pieces, and it considered as the measurement sample of the film covering method, respectively. Subsequently, the measurement sample was laid in the thermostat on 95% of humidity, the temperature of 35 degrees C, and the conditions of 24 hours, the number of bacilli before a trial (growth cluster) and the number of bacilli after a trial (growth cluster) were measured, respectively, and the following criteria estimated antibacterial. In addition, *Staphylococcus aureus* and the *Escherichia coli* of the number of bacilli before a trial (growth cluster) were 2.6x10<sup>5</sup>, respectively (an individual/test piece). Each result is shown in Table 1. Moreover, among Table 1, as for evaluation 5, the addition of soluble glass is the case where 0.3 weight and a trial bacillus are *Staphylococcus aurei*, the addition of soluble glass is the case where 0.2 % of the weight and a trial bacillus are *Staphylococcus aurei*, and the evaluation 7 of evaluation 8 is [ evaluation 6 / the addition of soluble glass is the case where 0.2 weight and a trial bacillus are *Escherichia coli*, and / the addition of soluble glass ] the case where 0.3 weight and a trial bacillus are *Escherichia coli*. In addition, also in Table 2, they are the same evaluation and a publication.

O : the number of bacilli after a trial is less than [ of the number of bacilli before a trial ] 1/10000.

O: the numbers of bacilli after a trial are less than more than 1/10000–1 of the number of bacilli before a trial / 1000.

\*\*: The numbers of bacilli after a trial are less than more than 1/1000–1 of the number of bacilli before a trial / 100.

x: The number of bacilli after a trial is 1/100 or more [ of the number of bacilli before a trial ].

[0058] [Examples 2–6]

(Creation of soluble glass) Soluble glass was created, respectively so that it might become the presentation shown in Table 1 on the same creation conditions as an example 1. In addition, it compares with an example 1 and is ZnO and P<sub>2</sub>O<sub>5</sub> at examples 2 and 3. Adjust an addition and the ratio of ZnO/Ag<sub>2</sub>O is made to increase, comparatively expensive MgO is not used but the addition of CaO and ZnO is made to increase in the example 4. Moreover, similarly in the example 5 MgO is not used, but they are CaO and aluminum 2O<sub>3</sub>. The content is made to increase.

[0059] (Evaluation of soluble glass) The same evaluation conditions as an example 1 estimated xanthochroism etc. about the obtained soluble glass, respectively. A result is shown in Table 1 (evaluations 1–8).

[0060]

[Table 1]

	実施例 1	実施例 2	実施例 3	実施例 4	実施例 5	実施例 6	実施例 7
A g <sub>2</sub> O	3.0	3.0	3.0	3.0	3.0	2.0	1.0
Z n O	5.0	10.0	15.0	9.0	5.0	9.0	5.0
P <sub>2</sub> O <sub>5</sub>	68.0	63.0	55.0	68.0	68.0	69.0	67.0
C a O	10.0	10.0	14.0	14.0	14.0	14.0	14.0
M g O	8.0	8.0	7.0	0.0	0.0	0.0	0.0
A l <sub>2</sub> O <sub>3</sub>	5.0	5.0	5.0	5.0	9.0	5.0	9.0
N a <sub>2</sub> O	0.5	0.5	0.5	0.5	0.5	0.5	0.5
C e O <sub>2</sub>	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ZnO /Ag <sub>2</sub> O	1.7	3.3	5.0	3.0	1.7	4.5	5.0
評価 1	○	○	○	○	○	○	△
評価 2	○	○	○	○	○	○	△
評価 3	○	△	△	○	○	○	○
評価 4	○	○	○	○	○	○	○
評価 5	○	○	○	○	○	△	△
評価 6	○	○	○	○	○	○	○
評価 7	○	○	○	○	○	○	△
評価 8	○	○	○	○	○	○	○

## [0061] [The examples 1–6 of a comparison]

(Creation of soluble glass) Soluble glass was created, respectively so that it might become the presentation shown in Table 2 like an example 1. In addition, it compares with an example 1 and is B-2 O<sub>3</sub> at the examples 1–3 of a comparison. While carrying out specified quantity addition, the content of ZnO is made [ many ] (33 – 50 % of the weight), and at the examples 4–6 of a comparison, it is B-2 O<sub>3</sub>. While carrying out specified quantity use, ZnO is not added or the addition is lessened (0 – 5 % of the weight).

[0062] (Evaluation of soluble glass) Xanthochroism etc. was evaluated, respectively about the soluble glass obtained in the examples 1–6 of a comparison on the same evaluation conditions as an example 1. A result is shown in Table 2.

[0063] The examples 1–3 of a comparison are B-2 O<sub>3</sub> so that clearly from a result. Although it got down by specified quantity \*\*\* and was considered because there are too many contents of ZnO, it was checked that the obtained soluble glass becomes cloudy and transparency is missing.

[0064] Moreover, the examples 4–6 of a comparison are B-2 O<sub>3</sub>. While containing, ZnO is not included, or the sake was seemed, but although considered because there are few contents, the obtained soluble glass was cloudy, transparency was missing, and it was checked that it is further easy to yellow.

## [0065]

[Table 2]

	比較例 1	比較例 2	比較例 3	比較例 4	比較例 5	比較例 6
Ag <sub>2</sub> O	1.0	1.0	1.0	1.0	3.0	3.0
ZnO	40.0	50.0	33.0	0.0	0.0	0.5
B <sub>2</sub> O <sub>3</sub>	15.0	10.0	30.0	20.0	20.0	30.0
P <sub>2</sub> O <sub>5</sub>	44.0	39.0	30.0	50.0	65.0	64.5
Na <sub>2</sub> O	0.0	0.0	1.0	0.0	9.0	2.0
CaO	0.5	0.0	5.0	29.0	20.0	0.0
ZnO /Ag <sub>2</sub> O	40.0	50.0	33.0	0.0	0.0	0.6
評価 1	△	×	×	△	△	△
評価 2	×	×	×	△	△	×
評価 3	○	○	○	×	×	△
評価 4	○	○	○	×	×	△
評価 5	○	○	○	○	○	◎
評価 6	○	○	○	○	○	◎
評価 7	○	○	○	○	○	◎
評価 8	○	○	○	○	○	◎

## [0066]

[Effect of the Invention] As explained above, it is Ag<sub>2</sub>O, ZnO, and P<sub>2</sub>O<sub>5</sub>. By containing by predetermined within the limits, it is B-2 O<sub>3</sub>. Antibacterial [outstanding] could be shown, without using it, and also the transparency and the mechanical strength of soluble glass can be improved and, moreover, yellowing of soluble glass could be prevented effectively. Moreover, even if it made such soluble glass mix into resin, or carried out the laminating on the surface of the cast and created an antibacterial resin constituent and antibacterial mold goods, a possibility of spoiling the color and transparency which resin and the cast itself have decreased as much as possible.

[0067] Moreover, this soluble glass can process a fixed configuration easily, and can be made now into the particle which has uniform mean particle diameter. Therefore, dispersibility became good, homogeneity can be made to mix into resin more now, and manufacture of an antibacterial resin constituent or antibacterial mold goods became easy. Furthermore, in the soluble glass, the antibacterial resin constituent, and the antibacterial mold goods of this invention, it can raise antibacterial now.

---

[Translation done.]